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BOOK REVIEWS

The Physics of Karma : A Requiem to Time
by V Dwaraknath Reddy
Mapin Publishing Pvt. Ltd., Ahmedabad, India, 1992
167 pages, illustrated (semihard glossy bound cover) ; price · Rs 275.00

The Physics of Karma is an excellent treatise devoted to the author's realization about the truth, meaning of life, death, law and order, the cause and effect prevailing everywhere in the universe, where at every moment, certain things are created, while others are annihilated; so that creation and destruction are constantly going on. Not only the constituents of the universe are affected by the Law of Change but also the universe itself. The author is a physicist with a Vedantic vision, obtained the Master of Science degree from Louisiana State University, USA.

The motivation of this work started at the tragic hour of bereavement at the sad demise of his brother, when he thought that death is beyond the answers of medical science even in this advanced age. In course of time, he turned his attention towards religious teachers and books like Sri Aurobindo's Bhagavath Geeta and Isavasya Upanishad to find the answers of his spiritual quest. The thoughts of Upanishad have anchored in his scientific mind and are reflected practically in every pages of his book and, in particular, in the appendix. The attitude of the author in some area is common with the experiences of Wilber [1] who started to change her diet to vegetarian side and practiced meditation during the period she suffered from breast cancer. This change of mind of a cancer patient in USA towards meditation during her painful phases of radiation and chemotherapy certainly answers Dwaraknath Reddy's questions—the search for alternative attitudes—"what kind of help really helps"? Wilber [1] also reported that when she got cancer she turned to the concept of philosophy "you create your own reality", which forced her to think about her past and generated a feeling that others must think what she had failed in some way due to the attack of cancer. This philosophy also produced the magical result that if one could find "the cause" one could correct it, root out the mistake, cleanse the past, change the future and successfully cure oneself. She found that in the late seventies some spiritual group of people in northern Scotland are very much conscious about the influence of their attitudes, actions and beliefs have on their experience of life. "Create your own reality" has been a quite popular concept in northern Scotland. Wilber [1] also believed a more Buddhist approach where everying that happened was considered as a change for bodhisattvic activity, for serving others. She looked

at the "odd" things that happened to her not as punishment for past actions, but as her present scope to work through KARMA of the past, to cleanse the slate. I wonder how the thoughts and actions of Wilber [1] in some area agree with Reddy's work on the Physics of Karma. The philosophical concept "create your own reality" has been very popularly described in page 132 of Reddy's book as "I must carry my burden".

Dwaraknath Reddy came in personal proximity with Ramana Maharshi to whom he dedicated the book "The Physics of Karma"—an offer in Silence. This book contains thirty six topics of which the last one is devoted to Sri Ramana Maharshi. The flow of consciousness and manifestation of Ramana that impinged upon his mind, and upon the mind of everyone who came in His close quarters or all those who remember Him :

"A beam of the Eternal smiles his heart,
His thought stretches into infinitude :
All in him turns to spirit vastness.
His soul breaks out to join the oversoul,
His life is oceaned by that superlife"

—Savitri : Book One . Canto Three
Sri Aurobindo

While writing the book review I could not check my feelings—the resonant vibrations in my mind flows through my pen, I am therefore, including some of my concepts in this work, although my mathematical approach differs from Reddy's S/T^2 equation of Karma as described in pages 113–118 of his book. I describe the field of consciousness related to Karma by the time-dependent Schrödinger equation :

$$i\hbar \frac{\partial}{\partial t} |\psi\ (t;r)\rangle \ = \ H|\psi\ (t;r)\rangle, \tag{1}$$

with

$$H \ = \ 1/2m\ \Sigma_i\ \left(P_i - e/c\ A(r)\right)^2, \tag{2}$$

determined from the Lorentz–force Lagrangian

$$L \ = \ 1/2 \sum_i \left[mv^2 + e/c\ v.A(r)\right]. \tag{3}$$

Here the superconscious momenta $p_i \rightarrow -i\hbar\ \partial/\partial t$ describes the Karmic impulse as Reddy has mentioned in his book on pages 123–124 that energy of Karma operates in the total mass of consciousness (m) and that Karma cannot operate without time :

"The Superconscient conscious grow on earth,
The Eternal's wonders join the dance of Time".

—Savitri : Book Three : Canto three

Reddy also said (page 123) that Karmic energy in its working on individual mind, which is linked by the modified form of energy of memory and may be described as particles with charge e which I have considered in the above equations. $A(r)$ is the vector field of Karma. In a previous paper (under publication) I have considered Consciousness as thought waves having wave – particle duality. Superconscious momenta in the form of impulse impinge upon the mind (the Ātman) whereby life energy $E \rightarrow \hbar\, \partial/\partial t$ is developed in the meditating mind. According to Vedanta philosophy the Ātman is wrapped by three sheaths– matter, life, and mind which are the closed orbitals, the eigenfunctions of the energy eigenvalue problem that emerges when time is separated in the usual way in eq. (1) :

"As if life's banner on the roads of space"

—Savitri : Book Two : Canto Three

$$\left|\psi\ (t;r)\right\rangle\ =\ \exp\left[-\frac{i}{\hbar}\int_0^t dt'\ E\left(\psi(t')\right)\right]\left|\psi_{E_i}(r)\right\rangle, \tag{4}$$

$$H\ \left|\psi_{E_i}(r)\right\rangle\ =\ E_i\ \left|\psi_{E_i}(r)\right\rangle, \tag{5}$$

where ψ_{E_i} with $i = 1, 2$, have different manifestations; E_1, is responsible for resulting reactions of matter, the material mind with hunger, thirst, fatigue (stress), physical health, disease etc., which depends on genetics life style, diet, environmental influences, social factors etc. It is in such a state of mind one thinks as Reddy in the epilogue of his book has described '...I lived in fear... Death had to be killed. I drew my sword whose blade was action... I crouched behind bushes...but of Death I found no trace'.

The eigenvalue E_2 appears in the spiritual mind which is in a state of absorbing the flow of Consciousness as Reddy has described in the epilogue : 'Then I found that... the weapon in my hand...had a blade of meditation... . In a low voice I said : There is no Death'.

More recently, solutions of eq. (1) on a conical surface has been given [2]. Reddy in the introduction of his book (page 12) has mentioned the concept of physicist about such a cone with its broad base grounded in objectivity and its apex kissing the fringes of subjectivity :

"A little point reveal the infinitudes,"

—Savitri : Book Two : Canto One

The male principle of the Universal Creation is the seed of Being, which is at the same time infinitesimally small and all-embracing. It is symbolized in the Shri yantra.

The Seers had long long ago considered the reversed cone of which the base was conscious subjectivity with eigenvalue E_2 and which tapered with its apex downward touching and embracing that point all of manifested matter with eigenvalue E_1:

"Inverting the Spirit's apex towards life"

—Savitri : Book Two : Canto Three

The solutions of eq. (1) on a conical surface are relevant when gravitational interactions are included [3]. Solutions of eq. (1) also suggest the role of a hidden, dynamical SO(2,1) symmetry group of conformal transformations, the dynamical symmetry first recognized for the 'inverse square potential [4], can be linked with Karmic gravity as Reddy suggested the role of need and opportunity must appear at the same instant, the considered thoughts of all those rightful participants in the manifesting event, the physical environment helpful to the event, must come together so as to focus apparently disconnected minds and totally disarranged matter to the field of action and reaction in the continuing purpose of consciousness and reveal its own hidden truth— the 'gravitation' of isolated building blocks towards that moment that fuses these materials into an event. This is the ultimate goal and method of Karma. The Law of Karma is evident when we survey from atoms to organisms, from individual properties to collective behaviour.

Table 1.

Name of the cluster :	atom	molecule	biomolecule	system	cell	organism
Number of atoms :	1	10	10^3	10^5	10^{10}	10^{20}

Schrödinger [5] called biomolecules "aperiodic crystals" Comparing ordinary periodic crystals, with biomolecules he said : "Yet, compared to the aperiodic crystal, they are rather plain and dull. The difference in structure is of the same kind as that between an ordinary wallpaper in which the same pattern is repeated again and again in regular periodicity and a masterpiece of embroidery, say a Rafel tapestry, which shows no dull repetition, but an elaborate, coherent, meaningful design traced by the great master".

From the fact that the wounds of an organism are healed up we infer the existence of a conscious agent who would be like the Master of the inner house; this has been considered by Reddy in the topic ' Who is the doer of action"? It was to this that the ancient wisdom gave the name of Karma as is evident when we consider the origin of life.

However, it may be useful to remember the words of a distinguished molecular biologists [6] : "An honest man, armed with all the knowledge available to us now, could only state that in some sense, the origin of life appears to be almost a miracle, so many are the conditions which would have had to have been satisfied to get it going". The Seers do not believe that the origin of life is a miracle. According to them creation cannot take place out of a single; so that, there must be two particles to produce a thing. Again, these two particles should not be of the same type as we find in the creation of an infinite source and an infinite sink, together forming the photons as a quark and anti-quark. This quark and anti-quark respectively create the electric and the magnetic fields of the e.m. radiation. When a photon moves with a speed c, the anti-photon moves with speed $1/c$ in the opposite direction. This

causes division between radiation and anti-radiation to prevent annihilation of both. From radiation we get elementary particles of matter like protons, neutrons and electrons, each with an equal amount of anti-matter particles. Condition for the survival of these particles is just similar to that of radiation *i.e.*, the division between matter and anti-matter. This duality concept of charge (consciousness) and vortices (cosmic whirl) in the meditative mind are like charges and vortices in superconductors, and are merely the two sides of the same reality as the base and apex of the cone mentioned earlier. A duality transformation, well-known in physics, which interchanges the role of charges and vortices can cause reversals of the base and apex of the cone in the path integral approach of the problem. If the action is invariant under this operation it is said to be 'self-dual'— the Reality.

The fundamental concept of Buddhism is to go beyond the pairs of opposites, to realize the spiritual world and become 'self-dual'. Reddy has considered the duality concept in his book (page 18) and said that mind functions amidst and through pairs of opposites, as Oppenheimer had realized : ..."whether the position of the electron remains the same, we must say 'no' ; if we ask whether the electron's position changes with time, we must say 'no'; if we ask whether the electron is at rest, we must say 'no'; if we ask whether it is in motion, we must say 'no'.

—J R Oppenheimer, Science and the Common Understanding : pp 42

This Heisenberg uncertainty-like reality is reflected in his mind from the Upanishad :

"It moves. It moves not.
It is far, and It is near.
It is within all this,
And It is outside of all this,"

—Isa Upanishad

and this is realized in

"Be in truth eternal, beyond earthly opposites!"

—Bhagavath Geeta

Reddy in his book (page 166) in some thoughts on Isavasya Upanishad has said that the mind, a product of time space compulsions may presume to lunch upon a linear path as it commences its adventure of discovery but it terminates as a circle and functions within the circle. That is why in creation the ultimate topological behaviour of everything from the atom to the universe has to repeat the contour of the mind– the circle or something like that originating from the Berry's phase as is evident from eq. (1).

In the Bible it is said that God created things from nothing. The Creator creates something in vacuum, which is more than nothing, *i.e.* potentially it contains all forms of the particle world. As a result of this creation (cause) something comes into existence, which is less than nothing. This idea seems to be echoed in the field theoretical concept of vacuum

which is not a state of mere nothingness; on the contrary, it contains an unlimited number of particles which come into being (like, a proton, an anti-proton and a pion are formed out of nothing and disappear again into vacuum) : it is just like a form in emptiness (a source : condensation in empty space) and emptiness in form (a hole) which echoes the concept of fuzzy measures in fuzzy logic that quantifies vaguenen and helps neural nets to reason more like humans.

The universal processes whereby the creative action of divine Brahman unfolds into contours (eigenfunctions) of space and time can be traced back through patterns of the form, to an original splitting into two, the time is separated in the usual way as shown in eq.(4). Reddy in his book (page 117) mentioned that there is 'passage of time' but no 'passage of space'. He wondered how time and space got thus distinguished if time-space was a continuum.

> "In any attempt to bridge the domains of experience belonging to the spiritual and physical sides of our nature, time occupies the key position".
>
> —A S Eddington : The Nature of the Physical World.

The reality in space-time continuum becomes clear from Tantra where time and space are symbolized as male and female ; sometimes a line of division is found to exist in an anthropomorphic image of a deity running down the center. It is also evident in the concept of Gayetree. This is the concept of unity in duality. Reality splitted as the sexual pair, Shiva and Shakti (Savitri), within us and everywhere in the universe, so intimately joined they are (as space and time) unaware of their differences beyond Time.

> "He shut her into himself in a circle of bliss
> And shut the world into himself and her.
> A boundless isolation made them one;
> He was aware of her enveloping him
> And let her penetrate his very soul,
> As is a world by the world's spirit filled,
> As the mortal wakes into Eternity,
> As the finite opens to the Infinite.
> Thus were they in each other lost awhile,
> Then drawing back from their long ecstasy's trance
> Came into a new self and a new world.
> Each now was a part of the other's unity"
>
> —Savitri : Book Five : Canto Three

This appears in another form in Reddy's book (page 109). 'In quest of the unified field' where he expressed that the "power to observe was the cardinal energy, the precedent cause behind the phenomena, and this power belonged to the mind whose springs of nourishment must be the very meaning of Life, far above the significances of matter of field". The Seers have visualized the superficial splitting into two : mind and matter, male and female, but in the

inner vision as revealed from the meditative diagram of a Shri yantra, they realized that both are basically of one construction and, therefore, subject to the same physical laws.

Tantra's view of the final goal, the approach to unity, is realized by a vision of cosmic sexuality. A Shri yantra, the most important of all Tantrik yantras, the meditative diagram, composed of nine interpenetrating triangular contours symbolic of male and female, with a central white mesoscopic dot. It reveals the vision of every constituents in the universe and the universe itself. All the different phases of the process of creation seem to exist at once, since we are looking backwards, beyond the flow of passing time. The question of the meaning of such reality was the central subject of a fascinating dialogue between Einstein and Tagore. Einstein emphasized that science had to be independent of the existence of any observer. This led him to deny the reality of time as irreversibility, as evolution. On the contrary, Tagore maintained that even if absolute truth could exist, it would be inaccessible to the human mind. Curiously enough, the present evolution of science is running in the direction pointed by the great poet and philosopher.

In the description of the infinite universe, the unlimited empty space, we assume that it can be regarded as a sphere with radius r, that expands infinitely ($r = \infty$) in time $t = 0$. Any sphere behaves as if time $t = 0$ increases the speed of this expansion. The radius of the empty space is $r = \infty$ in $t = 0$ (time-dilation); a point is a sphere shrinking infinitely until its radius $r \to 0$ in time $t = \infty$, and because $t = \infty$ is not possible, so that the radius will never become exactly zero. This is the concept of the universe as well as of the central mesoscopic dot in the Shri yantra. Here we notice the change of speed and the validity of Reddy's S/T^2—equation of Karma, although his interpretation is different.

In the creation of life which Crick [6] considered to be almost a miracle is not a miracle according to Seers. The fusion of semen and blood is necessary for the creation of a human organism. When such a fusion takes place in the mother's womb under the influence of Karma of the parents to experience pleasure and pain through the issue and the issue to have the experience of pleasure and pain through those parents, then that fusion becomes the seed of a human organism : "Pleasure and pain, desire and aversion, attraction and repulsion must be common to all atoms of an aggregate; for the movements of atoms which must take place in the formation and dissolution of a chemical compound can be explained only by attributing to them Sensation and Will"— Haeckel.

What Haeckel said about an ag atoms is true for human organism (Table 1). That there exists the influence of Karma—the thought force—the master of all action creating the right environment in the cosmic game of sexuality is evident from the fact that every union of a male and a female does not produce such a seed.

Jacques Vigine [7] discussed the role of the spiritual master, Guru and Sad-Guru, he compared the Guru and the psychotherapist, there are strikingly common points between

them. He mentioned that according to the Indian point of view, it will be difficult for the psychotherapist to be a Sad-Guru. Jung [8] mentioned the concept of inner Guru. Reddy in page 152 of his book has said that in the reality of one's own being is Dakshinamurthy, the Sad-Guru, the Silent one. He also said that pushed from outside by the "Guru" and pulled from within by the Sad-Guru.

"Matter and soul in conscious union meet
Like lovers in a lonely secret place :"

—Savitri : Book Two : Canto Two

Reddy considered thought as the subtlest form of matter.

In conclusion I like to point out a few more comments on the book :

The clear and mastery language are revealed everywhere in the text.

Instead of dealing with so many topics in a text it would be better to focus one or two topics of Karma, giving more details of the interesting points, going into more depths of the subject matter. But there is a risk as Sri Ramakrishna said about the salt doll, which Reddy mentioned in page 112 of his book : The salt doll takes a plunge into the ocean to discover much more .... . The purpose is gained the only way it gained -the doll disintegrates to transcend its limited identity to become identified with Saltiness. I also mean that in the depths of experience normally one loses expressions— becomes Silent :

"A power of silence in the depths of God";

—Savitri : Book Three : Canto Two.

... No reference and Index of Subject are given in the text which would have helped the readers.

.... The illustrations are mystic and imaginative. It would be better if their explanations be included in brief in the text.

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[1] T K Wilber 1988 *J. Transpersonal Psychology* **20** 49

[2] P Gerbert and R Jackiw 1989 *Commun. Math. Phys.* **124** 229

[3] S Deser and R Jackiw 1988 *ibid* **118** 495
[4] R Jackiw 1972 *Phys. Today* **25** No1 23
[5] E Schrödinger 1944, 1967 "What is Life?", Cambridge Univ. Press
[6] F H C Crick, Life itself; Its origin and nature p 88; Simon and Schuster, New York
[7] J Vigne 1991 *J. Transpersonal Psychology* **23** 121
[8] C G Jung *Ma vie. Paris : Gallimard*

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Hydrogen in Intermetallic Compounds I : Electronic, Thermodynamic and Crystallographic Properties, Preparation (Topics in Applied Physics, Vol 63)
edited by L Schlapbach
Springer-Verlag : Berlin-Heidelberg-New York-London-Paris-Tokyo-Hong Kong, 1988
xiv + 350 pages, 118 figures; price DM 118 (Hard Cover); ISBN 3-540-18333-7

The topical research on hydrogen in and on metals had its origin much earlier in 1866 when T Graham observed the ability of Pd to absorb large amounts of hydrogen. Since the continous interests of physicists, chemists, metallurgists in metal hydrides have produced an interesting class of new materials with the potential application as moderators in nuclear reactors and as energy storage in metal hydrides. A large amount of research work have been reported in journals and conference volumes on metal-hydrogen systems covering basic research. The current volume I and subsequent volume II now deal with hydrogen in intermetallic compounds and attempt to give a complete description of the existing knowledge and understanding of hydrogen in and on intermetallic compounds of the major families. Volume I, under review, contains several aspects namely, preparation, electronic, thermodynamic and crystallographic properties. The volume contains seven chapters written by eminent workers in this field. Chapter 1 is an introduction by the editor himself. Chapter 2 is on the preparation of intermetallics and hydrides. The thermodynamics of intermetallic compound-hydrogen system is covered in Chapter 3. A comprehensive review of the crystal and magnetic structures of ternary metal hydrides has been written by Drs. Yvon and Fischer. The electronic properties of a number of binary hydrides have been discussed by M Gupta and L Schlapbach. Most of the important hydrides have been considered by the authors. R Criessen and T Riesterer have explained the heat of formation models in binary and ternary metal hydrides. The band-structure model has also been considered. In the final Chapter 7, the magnetic properties, Mössbauer effect and superconductivity have been explained with

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several transition-metal-rich R-TM compounds, Laves-phase type compounds, CsCl-type compounds, amorphous alloys etc. The interesting part is the superconductivity in Th_4H_{15} and PdH and the subsequent developments in Pd-Cu-H, Pd-Ag-H with a higher T_c value around 13.6K, 15.6K and 16.6K.

The book is well-edited and all the contributing chapters are well-written with an up-to-date information on hydride materials. This is a valuable addition in the series and we look forward for volume II for the completeness.

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Stoichiometry in Crystal Compounds and its influence on their Physical Properties (Proceedings of the Lebedev Physics Institute, USSR, Vol 177)
edited by Yu M Popov
Nova Science Publishers · Commack, New York, 1988
304 pages, illustrated, price : $ 110.00 (hard cover); ISBN 0-941743-21-7

This volume is also a collection of articles by the Russian authors on the important A^2B^6, A^4B^6 and A^3B^5 type semiconductor compounds which play an important role in semiconductor physics, quantum electronics etc. The volume presents articles which analyze the properties of these materials, fabrication techniques and areas of applications. The degree of deviation from stoichiometry is an important parameter in these crystal compounds and this aspect has been considered with much emphasis. The crystal chemistry and physical properties of Cadmium and Lead Tellurides have been studied in detail. The composition stability range and the methods of controlling deviation from stoichiometry have been analysed. Similarly, the influence of stoichiometry in A^2B^6 monocrystal compounds has been studied by another group of workers in CdS, ZnSe, ZnO, ZnS systems. The chapters on "Piezoelectric effects and the influence of anisotropic deformation in GaInPAS/InP heterolasers" and "Radiative characteristics of nonstoichiometric melt-grown AlGaAs /GaAs laser heterostructures" present experimental investigations of laser heterostructures and their fabrication technology an important phenomenon in semiconductor technology. As mentioned in the introduction by the editor, "this volume contains an extensive collection of new and useful information on the properties of crystalline compounds, the influence of deviation from stoichiometry on these compounds and the use of a number of structures in semiconductor lasers". This is quite justified from the presentation of different articles. The book will be useful to semiconductor Physicists and engineers.

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New Developments in Semiconductor Physics (Lecture Notes in Physics, Vol 301) (Proceedings of the Third Summer School held at Szeged, Hungary, August 31–September 4, 1987)
edited by G Ferenczi and F Beleznay
Springer-Verlag : Berlin-Heidelberg-New York-London-Paris-Tokyo-Hong Kong, 1988
vi + 302 pages; price : DM 59 (Hard cover); ISBN 3-540-19215-8

This volume 301 of the series 'Lecture Notes in Physics' has been published as proceedings of the Third Summer School held at Szeged, Hungary in August 31–September 4, 1987. The Summer School was organized with a view to discussing recent developments in semiconductor physics which has been growing at a tremendous pace for the development of technology. There are number of important contribution from well-known workers in this field. We can mention some of them in the following J Hajdu (Köln, Germany) has summarized in the opening article, facts concerning the integer quantum Hall effect (QHR), and the different ideas and approaches to explain the QHE have been reviewed. The theory of the energy loss rate of hot electrons in 2D systems has been discussed by Erich Vass (Austria). A Novel general expression is derived for the (ELR) of hot 2D electrons due to their interactions with phonons. The loss rate theory explains quantitatively the temperature – and concentration dependence of the acoustic phonon limited (ELR). J T Derrese and F M Peeters (Belgium) have presented a theoretical survey of the cyclotron resonance of quasi 2D polarons in heterostructures. One polaron and many polaron–effects have been discussed. The electronic structure of complex defects in silicon has been dealt with Leite *et al* (Brazil) in which *ab initio* self consistent field electronic state calculations have been carried out for transition metal–related and hydrogen-related complexes in silicon. J Heydenreich (Germany) has made an interesting study of the application of electron microscopy in semiconductor physics specially in the studies of point defects and extended defects. Elemental semiconductor (Si, Ge) and compound semiconductors (A_3B_5, A_2B_6 types) have been considered. The defect dynamics in crystalline and amorphous silicon has been studied by S Pantelides (IBM, NY), which is quite stimulating. MOCVD technology for the epitaxial growth of compound semiconductors is an important technique along with MBE and LPE and this has been considered with much care and attention by Lars Ledebo (Sweden). The article is informative although much is now known about this technique. There are other important articles concering progress in semiconductors and the collection is certainly an important contribution in area. The editors have done good job.

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